UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/691,377	10/21/2003	Michael Francis Higgins	AB-2914 US	8648

32605 7590 08/22/2008

MACPHERSON KWOK CHEN & HEID LLP
2033 GATEWAY PLACE
SUITE 400
SAN JOSE, CA 95110

EXAMINER	
MA, TIZE	

ART UNIT	PAPER NUMBER
2628	

MAIL DATE	DELIVERY MODE
08/22/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/691,377	Applicant(s) HIGGINS ET AL.	
	Examiner TIZE MA	**Art Unit** 2628	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _07 May 2008_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-28_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-28_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _5/7/2008_.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant’s arguments, see page 10 of the Remarks, filed on May 07, 2008, with respect to Objections to the Specification have been fully considered and are persuasive. The objections have been withdrawn.

2. Applicant’s arguments, see page 11 of the Remarks, filed on May 07, 2008, with respect to Double Patenting rejections have been fully considered and are persuasive. The rejections have been withdrawn.

3. Applicant’s arguments, see page 12 of the Remarks, filed on May 07, 2008, with respect to Claim Rejection Under 35 USC 112 have been fully considered and are persuasive. The rejections have been withdrawn.

4. Applicant's arguments filed on May 07, 2008 with respect to Claim Rejections Under 35 USC 103 have been fully considered but they are not persuasive. The detail responses to every issue are as following.

5. Regarding claims 1 and 15, see pages 13-15 of the Remarks, the applicant argues that (1) Claims 1 and 15 contain the limitation that the target color space be divided into "regions bounded by W and two of a group, said group comprising: CI, C2 and C3". This feature is clearly seen, for one exemplary embodiment, in Figure 1 of the present application - with W as one of the vertices of the regions. Applicant avers that neither Childs nor Murdock disclose this particular limitation; (2) Applicant amends Claims 1 and 15 to contain the limitations that the target color space be divided into sets of non-overlapping regions. Childs - not only does not use an interior point (e.g. W) as a

bounding point for regions - but in addition, effectively teaches away from the use of non-overlapping regions because Childs actually constructs individual multipliers for each region.

6. Regarding the issue (1), the examiner disagrees to the argument. Although Murdock et al does not draw lines from the lines from the W point to other primary colors, W is treated as a primary color in the conversion process (column 3, lines 47-53). If the points representing the all the primary colors were connected by lines, the region in the color space would be divided exactly as that in the instant claims. Therefore the combination of Childs and Murdock et al would show the obviousness of the claimed limitation.

7. Regarding the issue (2), the examiner disagrees to the argument. Childs does not teach away from the use of non-overlapping regions. In Fig. 5, Childs divides the regions in the color space as non-overlapping triangles although the white color point is not one of the vertices. That is because the white color is not treated as a primary. When the white color is treated as a primary, as in Murdock et al, as discussed above, the non-overlapping regions (triangles) would be the same as that in the claims.

8. Therefore the rejections to claims 1 and 15 remain. The amended claims 1 and 15 now are rejected over the combination of Childs and Murdock et al, and further in view of Lin et al. See the claim rejections for the details.

9. Regarding claims 2-9 and 16-22, see pages 15-17 of the Remarks, each issue is addressed as following.

10. As claims 2-9 and 16-22 depend on claims 1 and 15, and claims 1 and 15 are rejected as explained above, the basis for the patentability in paragraph 1 on page 16 is removed.

11. As to claims 3 and 17, applicant requests that the Examiner point out these limitations that "the regions bounded by W and two of a group, said group comprising C1, C2 and C3 comprises triangles" with particularity within the references. The examiner points out here that Childs et al teaches dividing the color space using the primary color points as vertices, and Murdock et al teaches using W and RGB as four primary colors. The combination would divide the color space into regions bounded by W and two of a group, said group comprising B, G and B comprises triangles. The explanation is added to the claim rejections.

12. As to claims 4, 5 and 6, as well as 18, 19, and 20, more explanations are added to the claim rejections.

13. As to claims 8 and 22, the equation 3j on page 11 is the same as the equation in the instant claims, if P1-P4 represents RGBW. Since Childs et al does not use W as a primary color, Murdock et al is closer to the calculation in the instant claims. In Murdock et al, wherein W is chosen as a primary, the calculation is disclosed in column 6, lines 3-30. Numerically solving equation between line 25 and 30 in column 6, would yield the equations in the instant claims.

14. Regarding claims 10-13 and 23-26, see pages 17-21 of the Remarks, each issue is addressed as following.

15. As claims 10 and 23 depend on claims 1 and 15, and claims 1 and 15 are rejected as explained above, the basis for the patentability in last paragraph on page 17 and first paragraph on page 18 is removed.

16. In addition, applicant points out that Lin does not appear to supply the missing disclosure of the use of the white point W as a boundary point of non-overlapping regions in the target color space- as is required in Claims 1 and 15 of the present application. The examiner agrees that Lin does not disclose the use of the white point W as a boundary point of non-overlapping regions in the target color space. However, for out-of-gamut mapping whether or not using the white point W as a boundary point of non-overlapping regions in the target color space is not relevant as long as the white point itself is in both input and output gamuts. Obviously the white point is indeed both input and output gamuts in the instant application.

17. Applicant also points out that that Claims 10 and 23 as amended contain the limitation that the change effected is accomplished "as a function of the out-of-gamut coefficients" and applicant requests that the Examiner point out this limitation with particularity. The amendment merely inserted the phrase "as a function of" in the instant claims. The examiner considers any gamut mappings as a functional relationship between out-of-gamut color along with some conversion parameters/coefficients and the target in-gamut color. Therefore the amendment does not fundamental change the original claims. The rejections to the claims remain.

18. As to claims 11-12 and 24-25 depend on claims 10 and 23, and claims 10 and 23 are rejected as explained above, the basis for the patentability in fifth paragraph on page 18 is removed.

19. As to claims 13 and 26, the examiner agrees that the various concerned terms are explained in the specification. However, the interpretations of these terms by the examiner are still consistent with the specification. The rejections are made according to the interpretations. In column 11, lines 27-61, and Fig. 6, Lin et al discloses to map out-of gamut color by projecting the color from the out gamut region into the gamut boundaries. Such projection preserves the hue angle. Lin et al presented the computation in the L*a*b* space. In RGB space, the computation in Lin et al is equivalent to reducing all color components by the same factor. Therefore, although there may be differences between the detail calculations in Lin et al and the calculations disclosed in the specification in the instant application, the claimed inventions are equivalent.

20. In summary, rejections to claims 10-13 and 23-26 remain.

21. With respect to claim 14, applicant's arguments have been considered but are moot in view of the new ground(s) of rejection. Claim 14 now is rejected as being unpatentable over Lin et al, and in view of Cui et al. See claim rejection for details.

22. The newly added claims 27-28 are rejected as being unpatentable over Lin et al, and in view of Cui et al, and Murdock et al. See claim rejection for details.

Claim Rejections - 35 USC § 103

23. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

24. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

25. Claims 1-13 and 15-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Childs et al (GB 2282928 A), and in view of Murdock et al (US 6,897,876 B2), and further in view of Lin et al (US 6,421,142 B1).

26. Regarding claim 1 and 15, Childs et al teaches a method and a system (decoding circuit) for converting a three-color image data set (video signal) to four-color image data set (see Fig. 4 and lines 17-20 on page 12) by dividing (dissecting) the color space into non-overlapping regions (triangles) (see lines 9-10 on page 6, and Fig. 5), and determining the mapping from the three-color image data points to four-color image data points (a set of numerical solutions) (see lines 19-20 on page 13 and Appendix 1

on page 25). Childs et al uses the white point in his computation (see D65 in Fig. 3, and last three lines on page 5 and equation 1f on page 6).

27. However, Childs et al does not teach that W (white color) is used as a primary color in the target (four-color after conversion) color space.

28. Murdock et al teaches a method for converting three color (R, G, B) image data set (input signals) to four color (R', G', B', W) image data set (output signals) (see column 3, lines 49-54, and column 4, lines 56-61), where W is the white color for the benefit that employing a white OLED (Organic Light Emitting Diodes) along with the red, green, blue OLEDs to improve power efficiency and/or luminance stability of displays over time(column 1, lines 26-28). If the points representing the all the primary colors were connected by lines, i.e., connecting the points of R, G, B, and W by lines, the region in the color space would be divided into non-overlapping triangles bounded by W and two of R, G, and B.

29. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to converting a three-color image data set into a four-color image data set, by dividing a color space into regions, and determining a mapping from image data points comprising three colors to image data points comprising four colors with one of the colors as W (white) for the benefit of improving power efficiency and/or luminance stability of displays over time.

30. However, the combination of Childs et al and Murdock et al does not teach detecting image data points that are out-of-gamut; effecting a change in the out-of-gamut image data points to produce a color image data point that is within gamut range,

although Murdock et al discloses that any known gamut-mapping techniques may be applied to do the correction (column 6, line 35-40).

31. Lin et al teaches a method and system (apparatus) for detecting out-of-gamut (see steps S243, S245, and S247 in Fig 14; and column 13, lines 51-57) and mapping the out-of-gamut color points into the gamut range (see Fig 15; and column 14, lines 26-63) for the benefit of improving out-of-gamut mapping in a color reproduction system comprising an input device and an output device (see column 3, line 61-62, and column 4, line 11-12).

32. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the out-of-gamut color mapping after color space conversion as shown in Lin at el in the previous combination for the benefit of improving out-of-gamut mapping.

33. Regarding claims 2 and 16, Murdock et al teaches R, G, B as the three primary colors (see Fig. 1 and column 4, lines 56-61).

34. Regarding claims 3 and 17, Childs et al teaches divided regions as triangles (lines 9-10 on page 6; Fig. 5). When W (white) is used as a primary, as in Murdock et al (column 3, lines 48-52), the triangles are bounded by W and two of three primary colors, R, G, B.

35. Regarding claims 4 and 18, both references teach setting the white point to a desired value, and calculating the conversion coefficients/matrices (e.g., Column 5, lines 22-24 in Murdock et al; equations 1f on page 6, 2b-2d on page 7 in Childs et al). Although Childs et al does not disclose using white point as one of the primary colors,

the relationship between the white color and the RGB is still the same as when the white color is chosen as a primary color.

36. Regarding claims 5 and 19, the equation is taught as conventional in Childs et al (see page 6, line 1 in Childs et al. Again, the technique disclosed in Lin et al is applicable to the instant application. The far right column in equation 1f would be the values of Cr, Cg, Cb, Cw as in the instant claim if the four primary colors are chosen as RGBW as in Murdock).

37. Regarding claims 6 and 20, Murdock et all teaches setting different white point (additional primary close to white, see column 6, line 2-6). The actual values would be determined to adjust to different backlight condition.

38. Regarding claims 7 and 21, Murdock et all teaches setting different white point (additional primary close to white, see column 6, line 2-6). The actual values would be determined to adjust between the difference between the white points of source and target.

39. Regarding claims 8 and 22, Childs et al teaches calculating the mapping to four color space from intermediate coefficients with matrix (see lines 8-29 on page 11 for the description of the calculation. The equation 3j on page 11 is equivalent to the equation in the instant claims). Since Childs et al does not use W as a primary color, Murdock et al is closer to the calculation in the instant claims. In Murdock et al, wherein W is chosen as a primary, the calculation is disclosed in column 6, lines 3-30. Numerically solving equation between line 25 and 30 in column 6, would yield the equations in the instant claims.

40. Regarding claim 9, both references teach calculating source and destination colors for groups of known primaries and white points (see page 4, line 26-32 in Child et al for calculating source color; page 5, line 15-20 for calculating destination color) and numerically solving for the mapping (see the numerical solutions on page 25, Appendix 1 in Child et al). In Murdock et al, wherein W is chosen as a primary, the calculation is disclosed in column 6, lines 3-30. The equation between line 25 and 30 in column 6, is numerically solved.

41. Regarding claims 10 and 23, the combination of Childs et al, Murdock et al, and Lin et al remains as applied to claim 1 and 15 above. In particular, Lin et al teaches detecting out-of-gamut (see steps S243, S245, and S247 in Fig 14; and column 13, lines 51-57) and mapping the out-of-gamut color points into the gamut range (see Fig 15; and column 14, lines 26-63). Although Lin et al does not teach four color image data, since W is not an independent color, the W point would be included in any gamut defined by 3 independent colors. Therefore the technique disclosed in Lin et al is applicable to the instant application. As to the phrase "as a function of" in the instant claims, the examiner considers any gamut mappings as a functional relationship between out-of-gamut color along with some conversion parameters/coefficients and the target in-gamut color.

42. Regarding claims 11 and 24, testing each color component of the image data point to see if the color component is out of range is common practice of detecting out-of-gamut (see steps S243, S245, and S247 in Fig 14; and column 13, lines 51-57 in Lin et al).

43. Regarding claims 12 and 25, Lin et al teaches the maximum allowed value as the chroma magnitude of the largest coordinate (see line 50 in column 14). It is also the color value on the target gamut boundary.

44. Regarding claims 13 and 26, Lin et al teaches scaling the color components of the out-of-gamut image data point with a ratio between the maximum allowed value and the maximum coefficients of the out-of-gamut image data point (Column 11, lines 27-61, and Fig. 6, Lin et al discloses to map out-of gamut color by projecting the color from the out gamut region into the gamut boundaries. Such projection preserves the hue angle. Lin et al presented the computation in the L*a*b* space. In RGB space, the computation in Lin et al is equivalent to reducing all color components by the same factor. Therefore, although there may be differences between the detail calculations in Lin et al and the calculations disclosed in the specification in the instant application, the claimed inventions are equivalent).

45. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al (US 6,421,142 B1), and in view of Cui et al (US. Pub. 2004/0056867 A1).

46. Regarding claim 14, although using the different terminology, the instant claim is covered by Lin et al as part of his out-of-gamut color mapping strategy. Lin et al teaches an input channel to receive image data points (Fig. 1 input device 10); maximum coefficient detector (in Lin et al, the process of projection and clip is to find a corresponding color point on the boundary of the output gamut for the out-of-gamut color point. Therefore, the unit 87 along with unit 82 (87 labeled PROJ/CLIP CHROMA and 82 labeled CHECK GAMUTS in Fig. 15) performs the function of a maximum

coefficient detector and a scaling unit. The maximum refers to the chroma magnitude of the largest coordinates (line 50 in column 14) in the color space in the method of projection/clip (element 87 in Fig 15)); calculating a scaling factor for out-of-gamut image data point, and projecting out-of-gamut colors into the gamut boundaries. Such projection preserves the hue angle (which is equivalent to the coefficients of the interpolations in Lin et al, e.g., column 19, lines 30-43. See column 11, lines 27-61, and Fig. 6 for projections); an inverse look-up table (LUT) to store the scaling factors (LUT and interpolation coefficients (see column 20, line 19-22) and a scaling unit (the unit 87 along with unit 82 in Fig. 15).

47. However, Lin et al does not disclose the details for said scaling factor being a inverse value being a function of the maximum coefficient detected by said maximum coefficient detector; and said unit employing said scaling factor and changing the coefficients of said image data points to effect an in-gamut image data point.

48. Cui et al, in the same field of gamut mapping and for solving the same problem, teaches said scaling factor being a inverse value being a function of the maximum coefficient detected by said maximum coefficient detector; and said unit employing said scaling factor and changing the coefficients of said image data points to effect an in-gamut image data point (paragraphs [0029]-0032]. The equations (1) and (2) employs the scaling factor and go the gamut mapping. The ratio (L(T')-L(B'))/(L(T)-L(B)) is the scaling factor). Such a mapping preserves hue.

49. It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the out-of-gamut color mapping systems as shown in Lin at el and Cui et al for benefit of preserving hue.

50. Claims 27 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al (US 6,421,142 B1), and in view of Cui et al, and further in view of Murdock et al.

51. Regarding claim 27, Lin et al teaches a method for scaling out-of-gamut colors when mapping first colored image data in a first space to second colored image data into a second color space (gamut mapping strategy, column 3, line 66 – column 4, line 3), the steps of said method comprising:

mapping said first colored image data to said second colored image data (column 10, line 44; column 11, line 27);

detecting any said second colored image data as being out-of-gamut in said second color space (Fig. 14, steps s245 and s247).

52. However, Lin et al does not teach scaling the color components of the out-of-gamut second colored image data with a ratio between the maximum allowed value and the maximum coefficient of said out-of-gamut second colored image data.

53. Cui et al, in the same field of gamut mapping and for solving the same problem, teaches scaling the color components of the out-of-gamut second colored image data with a ratio between the maximum allowed value and the maximum coefficient of said out-of-gamut second colored image data (paragraphs [0029]-0032]. The equations (1)

and (2) employ the scaling factor and go the gamut mapping. The ratio (L(T')-L(B'))/(L(T)-L(B)) is the scaling factor). Such a mapping preserves hue.

54. It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the out-of-gamut color mapping methods as shown in Lin at el and Cui et al for benefit of preserving hue.

55. However, the combination of Lin at el and Cui et al does not teach that the first color space is a three-color space and the second color space comprises more than three colors wherein one such more than three colors is white.

56. Murdock et al teaches color space conversions from three colors to four colors, where one of four colors is white (column 3, lines 48-54) and that known gamut-mapping technique may be applied to map out-of-gamut colors into the target gamut range (column 6, lines 32-41). The combination of Lin at el and Cui et al would be such a technique. Although the combination does not teach four color image data, since W is not an independent color, the W point would be included in any gamut defined by 3 independent colors. Therefore the technique as shown in the combination of Lin et al and Cui et al is applicable to the instant application.

57. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the out-of-gamut color mapping method as shown in the combination of Lin at el and Cui et al in the situation of Murdock et al.

58. Regarding claim 28, the combination of Lin et al and Cui et al would show obviousness of wherein said step of scaling further comprises the step of looking up said scaling factor in an inverse look-up table (In Lin et al, see column 17, lines 10-14,

lookup table is used to store interpolation entries. Therefore such a lookup table would be used to store the scaling factor).

Conclusion

59. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TIZE MA whose telephone number is (571)270-3709. The examiner can normally be reached on Mon-Fri 7:30-5:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Xiao M. Wu can be reached on 571-272-7761. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Tm

/XIAO M. WU/
Supervisory Patent Examiner, Art Unit 2628